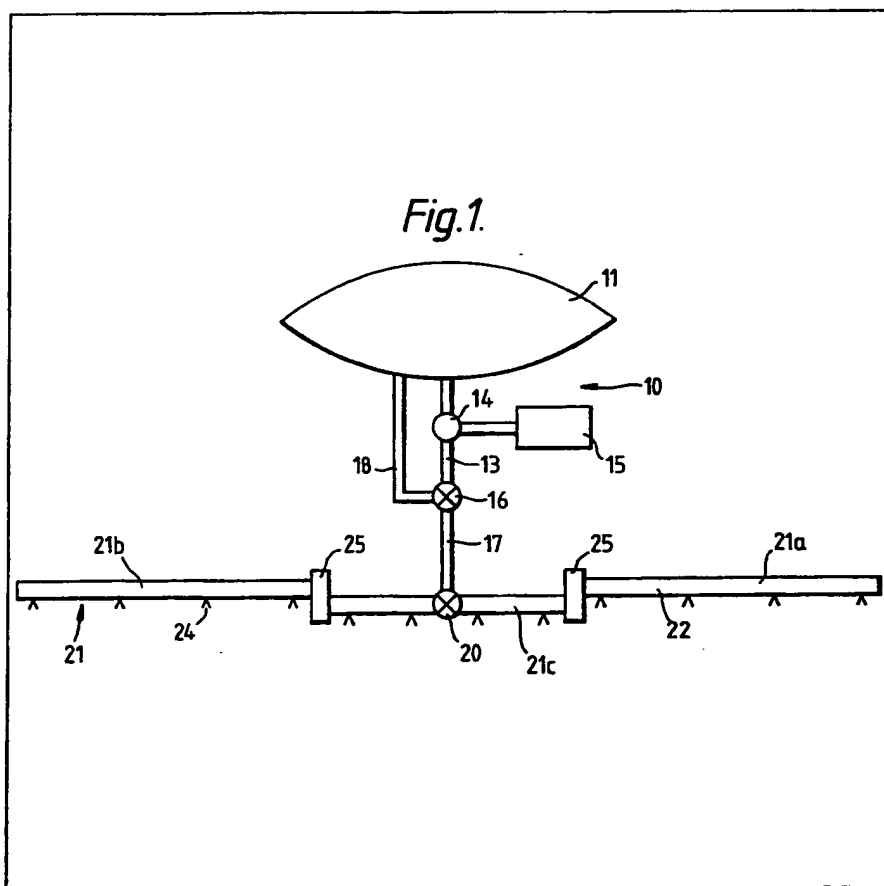


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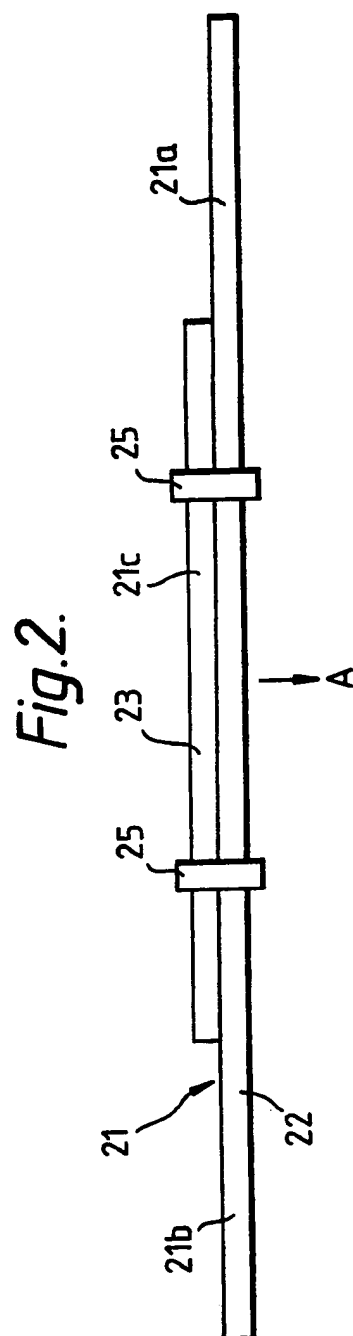
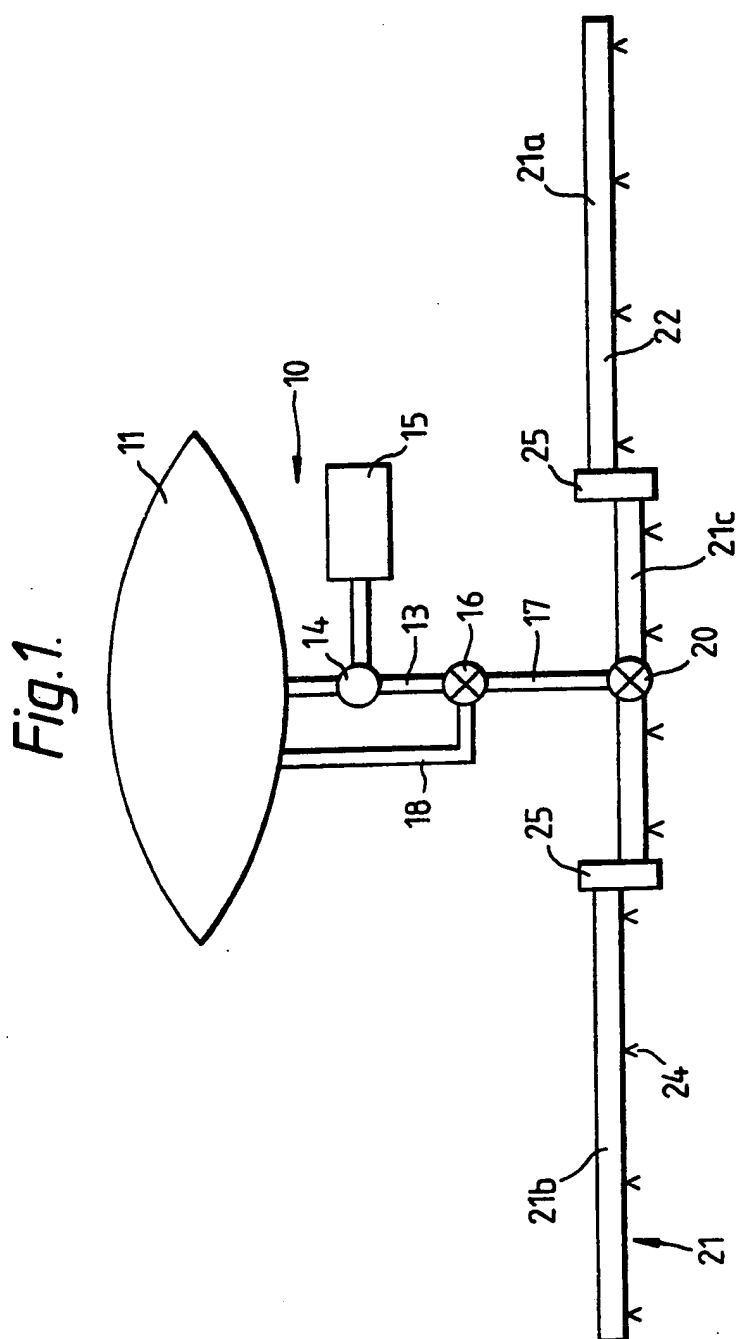
(54) An aircraft having spraying apparatus for spraying oil dispersant from the air to disperse oil on a water surface

(57) An aircraft has spraying apparatus for spraying oil dispersant from the air to disperse oil on a water surface. The apparatus comprises a reservoir (11) containing oil dispersant, an elongated spray boom or booms (21) having nozzles (24) spaced apart along its length, and a pump (14) for feeding dispersant from the reservoir to the spray boom or booms. A valve (20) permits dispersant to be sprayed through a selected one or more of said nozzles so as to spray a swath of predetermined width on the water surface.



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SPECIFICATION

Spraying apparatus for spraying oil dispersant from the air to disperse oil on a water surface

5 This invention relates to spraying apparatus for spraying oil dispersant from the air to disperse oil on a water surface.

According to one aspect of the present invention
10 there is provided a spraying apparatus for spraying oil dispersant from the air to disperse oil on a water surface comprising: reservoir means for containing oil dispersant; elongated spray means having a plurality of spaced apart nozzles; feeding means for
15 feeding dispersant from the reservoir means to the spray means; and selecting means for permitting dispersant to be sprayed through a selected one or more of said nozzles so as to spray a swath on the water surface of predetermined width.

20 In the preferred embodiment the spray means comprises first and second spray booms each having a plurality of spaced apart nozzles, the first boom being longer in length than the second boom.

Thus the selecting means may be arranged to
25 permit dispersant to be selectively fed from the reservoir means to the first boom and to the second boom.

The selecting means may comprise valve means located downstream of the feeding means and
30 upstream of the spray means.

The first and second booms may be pivotable about a longitudinal axis so dispersant issues from the nozzle or nozzles at a predetermined angle to the water surface.

35 The feeding means may comprises a pump arranged to be driven either by a prime mover or a windmill which is rotated by movement of the apparatus through the air.

Preferably the reservoir means is aerodynamically
40 shaped.

According to another aspect of the present invention there is provided an aircraft, for example a helicopter, having a spraying apparatus as recited above.

45 The invention is illustrated, merely by way of example, in the accompanying drawings, in which:-
Figure 1 is a schematic elevational representation of a spraying apparatus according to the present invention for spraying oil dispersant from the air to
50 disperse oil on a water surface; and

Figure 2 is a plan view showing, in greater detail, a spray boom structure of the spraying apparatus of *Figure 1*.

Referring first to *Figure 1* there is illustrated a
55 spraying apparatus 10 according to the present invention for spraying oil dispersant from the air to disperse oil on a water surface, for example, the surface of the sea. The spraying apparatus comprises a reservoir 11 for containing the oil dispersant.

60 The spraying apparatus is arranged to be suspended beneath an aircraft, for example a helicopter, by means of, for example, a sling or cradle (not shown). Dispersant from the reservoir 11 is pumped through a feed pipe 13 by a pump 14 driven by a prime mover

compression ignition engine. Alternatively, the pump 14 may be driven by a windmill which is rotated by movement of the spraying apparatus through the air. The feed pipe 13, downstream of the pump 14, connects with a three-way valve 16 which
70 in one position permits flow of dispersant to a pipe 17, in a second position permits flow of dispersant through a return pipe 18 back to the reservoir and in a third position prevents flow of dispersant to either the pipe 17 or the pipe 18.

In the first position of the valve 16 dispersant flows through the pipe 17 to a second three-way valve 20 which controls flow of dispersant into a boom structure 21. As shown in *Figure 2* the boom structure 21 comprises a leading boom 22 and a trailing boom 23, the leading boom 22 being of greater length than the trailing boom. The terms
80 "leading" and "trailing" are relative to the direction of movement, indicated by an arrow A, of the spraying apparatus through the air. In one practical embodiment the leading boom is 9 m in length and the trailing boom is 6 m in length. In one position of the valve 20 dispersant is fed to the leading boom 22 and in a second position is fed to the trailing boom
85 23, and in a third position dispersant does not flow to either boom. Each boom 22, 23 carries a plurality of nozzles 24 (only the nozzles on the leading boom 22 are shown), the leading boom having a greater number of nozzles than the trailing boom.

95 The spraying apparatus illustrated in the drawings, when not in use, has the valves 16, 20 in the third position so that dispersant cannot flow from the reservoir 11. In a standby condition, the valve 16 is moved to the second position and the prime mover 15 started so that the pump 14 circulates dispersant through the feed pipe 13, the return pipe 18 and the reservoir 11. When it is desired to start spraying dispersant on a water surface, the valve 20
100 is moved to either the first position or the second position and the valve 16 is moved to the first position. Thus dispersant is fed from the reservoir 11 by the pump 14 through the feed pipe 13 to the pipe 17 and to one of the booms 22, 23 and is sprayed through the nozzles 24 thereof. If dispersant is
105 sprayed from the boom 22 a swath sprayed on the water surface is of greater width than if the dispersant is sprayed from the boom 23. The valves 16, 20 are preferably electrically operated, the electricity being obtained, for example, from the prime mover
110 15, and are controlled from the aircraft.

It will be appreciated, therefore, that dispersant can be selectively sprayed through either the leading boom 22 or the trailing boom 23 so that the swath on the water surface is suited to the width of the oil to be sprayed with dispersant at any particular location. This has the advantage of reducing wastage of dispersant, which is relatively expensive, by reducing the amount sprayed on areas of the water surface where there is no oil, and in consequence
120 means that a given volume of dispersant can be used to treat a greater area of oil on the water surface than would be the case if the trailing boom 23 were not provided.

The boom structure 21 comprises sections 21a,

shown in the drawings by separate connectors 25. To stow the spraying apparatus, the connectors are released by removing, for example, locking pins, and the sections 21a, 21b, moved so that their distal ends 5 are adjacent and the connectors are then reconnected to the section 21c by the locking pins. If desired articulated or hinge joints could be provided in place of the connectors 25.

10 In the illustrated embodiment the nozzles 24 point directly downwards, that is perpendicularly to the water surface to be sprayed. However, if desired the boom structure may be constructed so as to be pivotable about its longitudinal axis so that dispersant issues from the nozzles 24 at a predetermined 15 angle to the water surface. It may, for example, be advantageous to direct the nozzles in a direction opposite to that indicated by the arrow A at an angle of 30° to 45° to the water surface to improve dispersal of the oil.

20 It will be appreciated that in order to spray selectively swaths of different widths on the water surface, the boom structure 21 may consist of a single boom, means being provided for permitting feeding of the dispersant through selected nozzles. 25 Thus, for example, the nozzles at opposite extremities of the single boom may have remotely operable valves to close when spraying a relatively narrow swath on the water surface and to open when spraying a wider swath.

30 To reduce drag as the spraying apparatus is moved through the air and so to reduce fuel consumption of the aircraft, it is preferable that the reservoir 11 is aerodynamically shaped.

35 CLAIMS

1. Spraying apparatus for spraying oil dispersant from the air to disperse oil on a water surface comprising: reservoir means for containing oil dispersant; elongated spray means having a plurality of 40 spaced apart nozzles; feeding means for feeding dispersant from the reservoir means to the spray means; and selecting means for permitting dispersant to be sprayed through a selected one or more of 45 said nozzles so as to spray a swath on the water surface of predetermined width.

2. Apparatus as claimed in claim 1 in which the spray means comprises first and second spray booms each having a plurality of spaced apart 50 nozzles, the first boom being longer in length than the second boom.

3. Apparatus as claimed in claim 2 in which the selecting means is arranged to permit dispersant to be selectively fed from the reservoir means to the 55 first boom and to the second boom.

4. Apparatus as claimed in claim 3 in which the selecting means comprises valve means located downstream of the feeding means and upstream of the spray means.

60 5. Apparatus as claimed in any of claims 2 to 4 in which the first and second booms are pivotable about a longitudinal axis so dispersant issues from the nozzle or nozzles at a predetermined angle to the water surface.

in which the feeding means comprises a pump arranged to be driven either by a prime mover or a windmill which is rotated by movement of the apparatus through the air.

70 7. Apparatus as claimed in any preceding claim in which the reservoir means is aerodynamically shaped.

8. Spraying apparatus substantially as herein described with reference to and as shown in the 75 accompanying drawings.

9. An aircraft, for example, a helicopter, having a spraying apparatus as claimed in any preceding claim.

80 New claims or amendments to claims filed on 1st. March 1982

Superseded claims 1 - 9

New or amended claims:- 1 - 8

85 CLAIMS

1. An aircraft having a spraying apparatus for spraying oil dispersant from the air to disperse oil on a water surface, the apparatus comprising: reservoir 90 means for containing oil dispersant; elongated spray means having a plurality of nozzles spaced apart along the length thereof; feeding means for feeding dispersant from the reservoir means to the spray means; and selecting means for permitting dispersant to be sprayed through a selected one or more of 95 said nozzles so as to spray a swath of predetermined width on the water surface.

2. An aircraft as claimed in claim 1 in which the spray means comprises first and second spray 100 booms each having a plurality of spaced apart nozzles, the first boom being longer in length than the second boom.

3. An aircraft as claimed in claim 2 in which the selecting means is arranged to permit dispersant to be selectively fed from the reservoir means to the 105 first boom and to the second boom.

4. An aircraft as claimed in claim 3 in which the selecting means comprises valve means located downstream of the feeding means and upstream of 110 the spray means.

5. An aircraft as claimed in any of claims 2 to 4 in which the first and second booms are pivotable about a longitudinal axis so dispersant issues from the nozzle or nozzles at a predetermined angle to the 115 water surface.

6. An aircraft as claimed in any preceding claim in which the feeding means comprises a pump arranged to be driven either by a prime mover or a windmill which is rotated by movement of the 120 apparatus through the air.

7. An aircraft as claimed in any preceding claim in which the reservoir means is aerodynamically shaped.

8. An aircraft substantially as herein described 125 with reference to and as shown in the accompanying drawings.